After a business has assumed large proportions, and research functions are distributed in scattered manufacturing and engineering departments, it is difficult to gather them together and coordinate them.

Let me remind those of you who may think this conception of research degrading that the present scientific limitation of the word is modern and confined to the exact sciences. The Century Dictionary gives its definitions in this order:

1. Diligent inquiry, examination or study,
2. Laborious or continued search after facts or principles,
3. Investigation,

and quotes from Cowper

> He sucks intelligence in every clime
> And spreads the honey of his deep research
> At his return—a rich repast for me,

so I think that the definition which I propose does not violate good usage. Even if it did would not the possibilities of development and usefulness to industry which this definition allows justify it in the same way that Bryce, in his "American Commonwealth," writing of the third quarter of the last century, said that the application of the name "university" to many institutions, which were no more than colleges or in some cases high schools, was a favorable sign because it showed an aspiration, and that where the aspiration existed the reality would follow? We all know to what a large extent this forecast has come true.

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THE NATURALIST'S PLACE IN HIS COMMUNITY[1]

Before beginning discussion I may say that I am not trying to say anything new or original and that I am not quite sure that I shall be able to make myself entirely clear in the limited time at my disposal. I do think, however, that the points which I shall mention should be more often opened to serious consideration.

Inasmuch as there are probably about as many different notions of "naturalist" as there are users of the word it may be necessary to say that by this term I now mean any one who is actively interested in living things as such.

In primitive societies most of the leaders are naturalists. In fact in most cases their leadership depends on attainments of that sort. The medicine man gains and holds his position very largely through his shifty use of knowledge of certain characteristics of animals in general and of his fellows in particular. The chieftain also usually bases his influence on successes derived from familiarity with activities of all sorts of animals. Certain women may gain indulgence or even general respect through exceptional familiarity with medicinal and food values of great numbers of plants and animals. It is, of course, easy to see that primitive leadership is thus conditioned because primitive man is individually in contact with the natural environment and appreciative of its mysteries; also because in an unspecialized social group all the members are sufficiently acquainted with every phase of activity to be able to understand and fairly to evaluate unusual skill and intelligence.

As society advances in complexity from the primitive stage and as more and more specialization occurs there are larger and larger numbers of individuals removed from natural to artificial conditions of existence. Not only so, but many of them are so far removed that they cease to have any knowledge of natural existence and so become entirely out of sympathy with those who retain some contact with and some interest in the natural order of things. This remoteness from nature may be physical as in the city dweller, or mental as in the rural resident who sees nothing but a pecuniary return through manipulation of same natural object. Thus it happens that the abilities of the naturalist tend to be obscured, ignored or derided in a complex society. His standing amongst his fellows is reduced to the lowest rank and his influence

[1] Read at the meeting of the Bay Section of the Western Society of Naturalists, Stanford University, November 29, 1918.

nears the vanishing point. It requires peculiar devotion to a cause to face such obscurity and indifference hence those who chose to be naturalists under such conditions are often seclusive, reticent and even indifferent to interests of others.

In recent years there has been a good deal of discussion of the need of considering the wholeness of organisms, of organizations of various social groups, etc. Every one seems ready to concede that we do not know a thing until we know all its relationships and that we do not know an organism or an organization until we know all its component parts. Every one seems willing to concede in the abstract that an organism is not complete if even the smallest part be missing or the obscurest function impaired. Practically when it comes to cases this view is not fully sustained as is well illustrated in case of the naturalist whose talents are insufficiently used and whose valuable point of view is largely ignored. The community as a whole suffers material loss from his submersion.

At this point it may be well to raise the question as to the proper status of the naturalist in our own social order. Should he be expected to take the highest place in leadership? Or a secondary place? Or should he be denied any leadership at all? Intelligent answer to such questions requires some examination of the naturalist's worth to his community or to society at large. Typically a statement of this worth may be brought under the following heads. (1) He may make discoveries which will extend the sources for food, clothing, transportation and manufacture. (2) He may make discoveries which enable better preservation and greater conservation of resources in health and wealth. (3) He may make discoveries which will enable better understanding of the fundamental laws governing the activities of all living things. (4) With his broad outlook he may so organize all available knowledge as to obtain better development of natural resources and better distribution and use of natural products. (5) He may so systematize useful information as to make essential features readily available for specialists with limited time and restricted outlook. (6) He may so condense, simplify and popularize available information as to make it not only usable but to some extent tasteful to those unskilled in scientific thought. Thus the sympathy of his fellows may be extended and their positive support secured. (7) He may be on the lookout for young people with ability who need encouragement to proceed along lines of study in natural history and he may so encourage them. (8) Last, but not least, he may himself give time consistently and regularly to consideration of the problems of his community and of society at large and he may then exert his voice and influence for the things which from his broad viewpoint appear right. Thus he may to some extent act as a balancing power even though he may not have or care to exercise powers of aggressive leadership.

From the foregoing it must appear that the naturalist should be accorded and that he should be willing to assume a place of very considerable importance in our social order. The character of this place will vary materially with conditions. In a small community existing under very simple conditions a naturalist of even modern abilities might be expected in most cases to be dominant in leadership. In a larger, more complex community only one of exceptional ability might reach great prominence. In such a community the naturalist of moderate ability would probably be limited to exerting influence in various ways. His efforts might bring larger results and his life accomplish more than in the smaller community though obscured by his relatively less importance. Here and there are a few naturalists of sufficient general ability to assume leadership in national affairs. It is a matter of great importance that they should be encouraged to do so.

This paper must further concern itself mainly with the naturalist of moderate ability, limited opportunities and restricted field, that is to say the ordinary sort. It seems to me that he ought to be encouraged to think of himself as having an obligation to the community, an obligation beyond the direct results of his scientific work, the obligation of

personal activity and interest in community affairs. This interest might be manifested by public and private discussion of public problems and community affairs. In such discussions the naturalist is peculiarly equipped for seeing the necessity of complete analysis of a question since he himself is repeatedly confronted with complex situations due to a multitude of factors, all of which must be more or less accurately evaluated. He is also able to see the need of giving time for a situation to develop itself since he is so familiar with the fact that Nature is unhurried in her operations whether their duration be seconds or ages. He is able to see the need of caution and accuracy in procedure since he is so frequently confronted with errors due to the impossibility of eliminating chance combinations. That is to say, the naturalist is able to bring to the consideration of a problem those methods which tend to accuracy of judgment and clarity of vision. Certainly any individual who can do this in a community should exert a valuable influence.

Since the members of a highly specialized community have a marked tendency to become narrow, one-sided, and so, to a considerable degree, abnormal, it is very necessary to have some influence in the other direction. This, too, the naturalist may be able to supply to a great extent. Popular talks on natural phenomena in connection with schools, churches or other organizations may be made of value. Pictures may be largely used for this purpose. Ordinary conversations may often be turned to advantage along this line. Simple exhibits of various sorts may be possible. Any method which will induce even superficial acquaintance of the general public with the great world of life is of distinct advantage from the standpoint of the human community however it may be from the scientific standpoint. Note particularly in this connection that the beneficial effect is reciprocal, *i. e.*, the narrow are broadened, the one-sided more rounded and the abnormal made more nearly normal on the one hand, while on the other hand the naturalist is stimulated, pleased and supported in his work, both financially and morally in a way not before possible.

Since there may be some who are still wondering what is the object of this paper I may call attention to the fact that we have to-day some very strong evidence pointing to the view that the day of individualism is rapidly passing and that the day of collectivism (of some sort) comes on apace. It is no more permissible for the man of science to shut himself up in his own interests and to assume an air of lofty indifference to the aims and aspirations of other people than it is for the business or professional man to do so. It is time for the man of science to take some cognizance of public affairs and to assume an active part therein, however small, no matter how much he may be tempted to go into his laboratory or his woods and fields and to ignore the general interests of humanity. It seems to me not at all beneath the dignity of such a body as this to consider ways and means of getting in closer touch with the people about us, of arousing their interest in us and our interest in them, and thus contributing our share toward the harmonizing of society as a whole. I feel certain that there are hundreds of people in this state who ought to have some interest in some or all of the things which we as individuals are doing. I think our state would be a better state if there were some understanding of that sort. It seems to me that we are too much disposed to let the especially able men like Dr. Jordan, Dr. Ritter, Dr. Evermann and others do what they can and to feel that we ourselves are thereby relieved of obligation. I do not think that is a correct attitude. If we want to have the general public respond as it should to the call for progress in scientific matters, we must each be willing to sacrifice some prejudice, some leisure and some effort for the good of the cause. I think too that we should collectively look over the field and consider the possibility of instituting or extending some activity that will help. What I have said simply indicates some of the lines along which I think activity might possibly be directed.

In conclusion, let me say that I think the naturalist ought to fill in his community a place of influence or of leadership, that be-

cause of his qualifications he ought, if necessary, to seek such a place, and that an organization of naturalists ought to definitely consider ways and means of extending its influence as far as possible.

This is a day of propaganda. The unworthy type will prevail if it is not overridden or displaced by the worthy type. Any and every learned society is under constructive obligation to do what it can in such a cause, but we must always remember the danger of attempting anything of the sort without first eliminating all traces of pedantry.

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CHARLES CONRAD ABBOTT AND ERNEST VOLK[1]

THE recent death of Dr. C. C. Abbott and Mr. Ernest Volk[1] of Trenton, New Jersey, removes two investigators whose work must always occupy a prominent place in attempts to estimate the conditions and chronology of prehistoric man. Not long after the discovery of palæolithic implements in northern France and southern England establishing the existence of man in Europe before the close of the Glacial period, Dr. Abbott began reporting the discovery of implements of similar type in the gravel deposits of glacial age upon which the city of Trenton is built. The first report of his discoveries was made to the Smithsonian Institution in 1875. Between 1875 and 1888 he had found sixty such specimens in the undisturbed gravel at various depths, some of which were as much as twenty-two feet from the surface.

As a resident of Trenton, Mr. Volk's attention was naturally called to Dr. Abbott's discoveries at the outset; but it was not until the fall of 1889 that he began systematic work, under the direction of Professor Putnam, for the Peabody Museum of Harvard University. His services continued for twenty-two years. The result of his long exploration of the Trenton gravels was published in 1911, in Volume V. of the Papers of the Peabody Museum of American Archæology and Ethnology. The report proper fills 258 octavo pages, which summarizes his journals from 1889 to 1905, and after that gives his journal in full, in which every day's work is carefully recorded. This fills one hundred pages. There are one hundred and twenty-five photographic illustrations.

In 1880, I was requested by Professor Putnam and Asa Gray to visit Trenton in the interests of the Peabody Museum, to shed what light I could upon the character of the gravel deposits in which palæolithic implements had been found by Dr. Abbott. This I did in company with Professor Boyd Dawkins, of England, who was then in Boston giving a course of Lowell Institute lectures, and Professor Henry W. Haynes, who had made collections from all the fields in Europe and in Egypt where palæolithic implements are found, and with Mr. H. Carvill Lewis, a glacialist of the highest reputation, who afterwards was joined with me in the survey of the terminal moraine across the state for the Pennsylvania Geological Survey; and whose report on the Trenton gravels published as an appendix to Abbott's "Primitive Industry" establishes beyond question the late glacial age of the deposit. Since then I have visited the region almost every year and some years several times, and at two different times spent days together with a committee appointed by the A. A. A. S. to make explorations. It is therefore proper that I should speak in defense of the discoveries, especially of Dr. Abbott and Mr. Volk in view of the fact that persistent attempts have been made to discredit them.

The chief reason for doubting the accuracy of these observations appears to have been that while Dr. Abbott and Mr. Volk had made so many discoveries, hardly anybody else has made any. But to this objection it is sufficient to say that Dr. Abbott and Mr. Volk have had a thousand opportunities to make discoveries where other investigators

[1] A notice of Dr. Abbott's death was given in SCIENCE, September 12. Mr. Volk was badly injured in an automobile accident on September 15 and died without recovering consciousness, two days afterwards.